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Do Dietary Calcium Intake and Hormone Replacement Therapy Affect Bone Mineral Density in Women?

Diyetle Alınan Kalsiyum ve Hormon Replasman Tedavisi Kadınların Kemik Mineral Yoğunluğunu Etkiler mi?

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Objectives: In this study, the relationship between postmenopausal bone mineral density (BMD), and hormone replacement therapy (HRT) and the level of dietary calcium intake in women was investigated.

Patients and Methods: Two hundred postmenopausal women (mean age 58.89±8.51 years; range 42 to 83 years) were evaluated retrospectively. Menopausal age and duration, HRT status, and daily dietary calcium intake of all patients were recorded. Evaluation of BMD was made with Dual Energy X-Ray Absorptiometry (DEXA) from lumbar spine and femur and the T scores were obtained.

Results: There was a significant negative correlation between the patients' age and duration of menopause, and BMD. The BMD values of the patients not receiving HRT were significantly lower than those of the patients receiving HRT. In women with dietary calcium intake above 1000 mg/day, spine and femur BMD values were significantly higher than in those with an intake below 600 mg/day and between 600-1000 mg/day.

Conclusion: We think that dietary calcium intake and HRT status can be an indicator for BMD in postmenopausal women.

Key Words: Osteoporosis; dietary calcium intake; bone mineral density; hormone replacement treatment.

Amaç: Bu çalışmada, kadınların diyetle kalsiyum alım düzeylerinin ve hormon replasman tedavisi (HRT) alma durumlarının menopoz sonrası kemik mineral yoğunluğu (KMY) ile ilişkisi araştırıldı.

Hastalar ve Yöntemler: İki yüz menopoz sonrası kadın (ort. yaş 58.89±8.51; dağılım 42-83) geriye dönük olarak değerlendirildi. Menopoz yaşı, menopoz süresi, HRT alıp almadığı ve diyetle kalsiyum alım düzeyleri kaydedildi. Kemik mineral yoğunluğu değerlendirmesi, lomber omurga ve femurdan Dual enerji X-ray absorbsiyometri (DEXA) cihazı kullanılarak yapıldı ve T skorları belirlendi.

Bulgular: Hastaların yaşı ve menopoz süresi ile KMY arasında istatistiksel olarak anlamlı düzeyde negatif ilişki vardı. Hormon replasman tedavisi alanlarda, almayanlara göre KMY değerleri daha yüksekti. Diyetle kalsiyum alımı günlük 1000 mg'dan daha fazla olan kadınlarda omurga ve femur KMY değerleri, kalsiyum alımı 600 mg/gün ve 600-1000 mg/gün olan kadınlardan anlamlı derecede daha yüksekti.

Sonuç: Menopoz sonrası kadınlarda diyetle alınan kalsiyum düzeyi ve HRT alım durumunun KMY açısından bir belirteç olabileceği düşünüldü.

Anahtar Sözcükler: Osteoporoz; diyetle kalsiyum alımı; kemik mineral yoğunluğu; hormon replasman tedavisi.

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The risk factors causing a low bone mineral density (BMD) are generally old age, genetic and racial factors, hormonal condition, type of nutrition, habits, life style, various drugs and diseases. Age, race and genetic structure are invariable risk factors. However, variable risk factors are life style, habits and especially nutrition.[1]

The most important factors in calcium metabolism in respect to the development of peak bone mass (PBM) and in the treatment of osteoporosis, is the intake and absorption of sufficient calcium through the intestine. Calcium is absolutely necessary for the development of an optimal PBM especially in children and young adults. Sufficient calcium intake also decreases bone loss in the postmenopausal stage. Therefore, adequate calcium intake should be provided in all stages of life.[2,3]

In this study, with the aim of scrutinizing the risk factors in respect to osteoporosis, the relationship between postmenopausal BMDs, and history of the application of HRT and the levels of dietary calcium intake of women were investigated.

PATIENTS AND METHODS

Two hundred postmenopausal women (mean age 58.89±8.51 years; range 42 to 83 years), attending the Osteoporosis (OP) clinic of the Physical Medicine and Rehabilitation Department were included in our study.

The detailed demographic properties of all cases were noted. All the cases were those experiencing menopause over the age of 40, however; early or secondary menopausal cases were excluded.

It was carefully examined that no pathological conditions were present in the serum calcium, magnesium, phosphorous, alkaline phosphatase, creatinine, urine calcium, creatinine clearance analysis of all the cases. The hormone levels (oestradiol, FSH, LH, prolactin, PTH, thyroid hormones, TSH) were in the normal range specified according to their ages. It was noted that drugs affecting calcium hemostatis were not taken by the patients.

Metabolic diseases (such as diabetes mellitus), anaemia (excluding chronic disease anaemia), chronic parenchymal diseases (such as chronic liver failure, chronic renal failure), congenital or acquired rheumatic diseases and cerebrovascular diseases might affect the patients BMD and thus, patients with these diseases were excluded from the study.

The duration and the menopausal age were noted.

The patients were questioned for whether they were receiving HRT or not. They were divided into two groups according to HRT status.

Habitual dietary calcium intake in women was questioned. It was calculated as the mean of the estimated daily dietary calcium intake. This calculation was made with calcium including rate determined by Turkish Dietitian Association. The women were classified according to their habitual calcium intake: those with an intake below 600 mg/day (n=31), between 600 and 1000 mg/day (n=95), and above 1000 mg/day (n=74).

Evaluation was made with DEXA using the Norland apparatus for the BMD measurements of all the patients. The T scores were determined by measurements made in the lumbar 2nd, 3rd and 4th vertebra and femoral neck, trochanter and the Ward's triangle.

When all the parameters were recorded, with the aim of investigating the risk factors of OP, the relationship of the T scores, obtained from the BMD measurements, with these parameters and the difference between the groups were investigated.

Descriptive statistics were expressed as mean±SD. All variables were tested for normal distribution by the Kolmogorov-Smirnov test. The student t-test (Mann-Whitney U for the nonparametric groups) was used in the evaluation of the difference between the two averages of the independent groups, one-way analysis of variance (ANOVA) test (Kruskal-Wallis for the nonparametric groups) was used for the evaluation of the difference between more than two averages of the independent group and Pearson correlation analysis was used in the evalua-

tion of correlations. P value less than 0.05 was considered statistically significant. Data were analyzed using MINITAB for Windows 13.32 package program (MINITAB Inc. US).

RESULTS

The mean menopausal age and duration of menopause were 46.16±4.53 (min=40.0, max=69.00) and 12.78±8.15 (min=1.0, max=38.00) respectively.

T score in BMD measurement mean values of all groups were detected as –1.67±1.39 (min=–5.17, max=2.87) for L2-4, –1.89±1.36 (min=–5.35, max=3.02) for L2,–1.60±1.30 (min=–4.86, max=3.33) for L3, –1.46±1.41 (min=–4.79, max=3.25) for L4, –1.11±1.00 (min=–4.41, max=1.65) for femur neck, –1.14±0.96 (min=–4.27, max=1.78) for trochanter and–1.92±1.02 (min=–4.95, max=2.21) for ward's triangle.

There was a significant negative correlation between the patients' age and the T scores of all the regions except for L4 (r=–0.269, p<0.001 for L2-4; r=–.0302, p<0.001 for L2; r=0.256, p<0.001 for L3; p>0.05 for L4, r=–0.313, p<0.001 for the femoral neck; r=–0.165, p<0.05 for the trochanter and r=–0.391, p<0.001 for the ward's triangle).

No correlation was found between menopausal age and the BMD values in any region (p>0.05 in all areas).

Statistically significantly level of negative correlation was found between the duration of menopause and the BMD measurement results obtained from all regions (r=–0.293, p<0.001 for L2-4; r=–0.284, p<0.001 for L2; r=–0.288, p<0.001 for L3; r=–0.159, p<0.05 for the femoral neck and r=–0.376, p<0.001 for the ward's triangle).

It was observed that the group receiving HRT were statistically significantly different from the group not receiving HRT at the T scores obtained from all regions except L3 and ward's (t=2.869, p<0.01 for L2-4; t=2.407, p<0.05 for L2; p>0.05 for L3; t=2.358, p<0.05 for L4; t=3.977, p<0.001 for femur neck; t=2.874, p<0.01 for trochanter and p>0.05 for ward's triangle), (Fig 1).

According to habitual dietary calcium intake, there were significant differences among the groups with respect to the BMD values at all sites (F=98.145, p<0.001 for L2-4; F=53.868, p<0.001 for L2; F=69.055, p<0.001 for L3; F=57.714, p<0.001 for L4; F=40.100, p<0.001 for femur neck; F=30.488, p<0.001 trochanter and F=25.107, p<0.001) for ward's triangle. The third group exhibited significantly higher BMD values at all sites than those of first and second group (p<0.05), whereas in the second group, spine and femur BMD values appeared to be significantly higher than those of the first group (p<0.05), (Fig. 2).

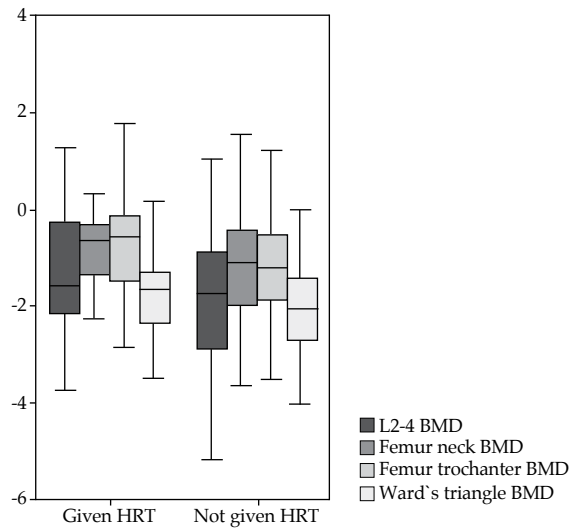

Fig. 1. *Comparisons of the T scores obtained from all regions in the postmenopausal women receiving or not receiving HRT.*

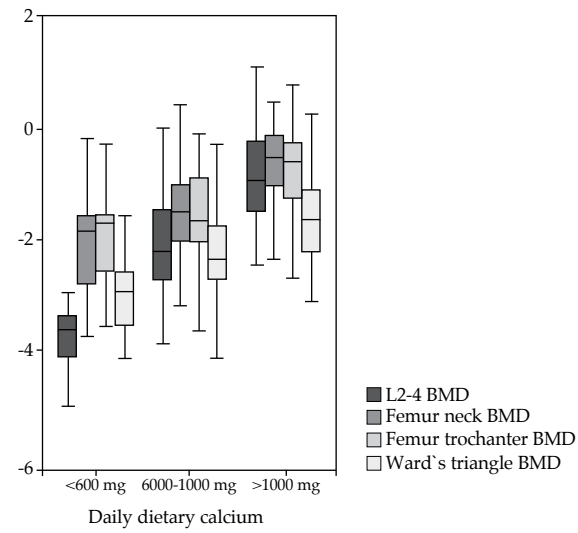

Fig. 2. *Comparisons of the T scores obtained from all regions in the postmenopausal women according to habitual dietary calcium intake.*

DISCUSSION

Osteoporosis is one of the most frequently observed chronic health problem in the old population. This clinic syndrome which starts asymptomatically and progresses may continue this silent progression until it reveals itself with an important problem such as a fracture. It is possible to overcome complications by searching for the risk factors in the early stages and by making BMD evaluations at an appropriate time. Identification of mechanisms and factors determining the bone cycle and bone density are rather important in the understanding of the pathophysiology and treatment of osteoporosis.[4]

Like many other chronic diseases, the incidence and prevalence of osteoporosis shows an increase with age. In our study results, a statistically significant level of negative correlation was observed between age and BMD. Similar results have been stated in the literature.[5]

Absence of oestrogen, observed in association with gonadal insufficiency, which appears in menopause, is responsible for the rapid bone loss in women. The average bone loss rate of BMD in untreated postmenopausal women is at the highest level in the first five years after menopause.[6] In our study results, the negative correlation found between the length of the menopausal stage and the BMD values were in accordance with the information given in the literature.

A relationship was not observed between the age of menopause and the BMD values of our patients. This was thought to be because of the exclusion criteria of the early menopausal condition which affects the BMD values to a great extent and because there was no history of early menopause in any of our patients.

There are a great number of studies stating that HRT has positive effects on BMD. In their studies, Levine[7] and Burkman[8] have mentioned the prevention of osteoporosis and the decreasing fracture risk effect of HRT when given in the postmenopausal stage. Also in our study results, the BMD values were found to be higher in the group given HRT in the postmenopausal stage when compared with the group not given HRT.

Adequate calcium intake is considered the most important lifestyle factor for attaining and maintaining adequate bone mass. Nutrition rich in calcium, especially in the growth and developmental stages, is very important in reaching PBM. In the following years however, it is important in the preservation of the bone mass. The relationship between dietary calcium and BMD, in studies carried out on both the young population and in the postmenopausal stage, has not been fully enlightened. While a positive relationship between dietary calcium and BMD has been shown in studies carried out in childhood and adolescent patients,[9] some investigators have stated that there is no such relationship.[10,11] The same contradiction is present in studies carried out in the postmenopausal stage and the relationship between dietary calcium and BMD or fracture risk has not been fully enlightened. While some studies mention the protective effect of calcium on BMD,[12] others have not found a relationship between calcium intake and fracture risk.[13] In our study results, a positive correlation was present between the level of dietary calcium and BMD in all the measured regions (femoral and lumbar) and the BMD values were higher in patients who had taken large amounts of calcium.

Michaelsson et al.[14] in a study which they carried out on healthy postmenopausal Swiss women, who were divided into three groups; those who had taken large, medium and low amounts of dietary calcium, found that the BMD values were higher in the group who had taken large amounts of calcium. They have found an average of 11% difference in the femoral neck, 8-11% difference in the lumbar spine and 5-6% difference in all the measurements of the whole body in comparison to the groups with medium and low calcium intake. Suleiman et al.[15] have also reported a positive correlation between calcium intake and BMD measurements in all the regions of the body. In a study carried out by Rodriguez and Novik,[16] it was concluded that a simple questioning of dietary calcium

intake could not be a guide to the low BMD in the menopausal stage or to the identification of women with rapid bone loss.

In a study where Videman et al.[17] investigated the effects of environmental factors on the genetic tendency in the determination of BMD, 105 monozygotic twin males in the 35-69 age range were evaluated. As a result, the BMD of the femur neck was found to be related with the level of dietary calcium.

The data summarized here show that adequate calcium intake and receiving HRT for osteoporosis provide reductions in BMD loss at the spine and femur among women. The recommended dietary intake of calcium is above 1,000 mg/day for women.

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